

Mark schemes

Q1.

- (a) 1. Variation/differences due to mutation/s;
 2. (Reference to) allopatric (speciation);
Ignore sympatric speciation.
 3. Smaller/different lakes have different environmental conditions

OR

Smaller/different lakes have different selection pressures;
Accept different populations for different lakes.

4. Reproductive separation/isolation

OR

No gene flow

OR

Gene pools remain separate;

5. Different alleles passed on/selected

OR

Change in frequency of allele/s;

6. Eventually different species/populations cannot breed to produce fertile offspring;

4 max

- (b) 1. Correct answer of $10/10.4 = 2$ marks;;
Ignore any numbers after 10.4

2. Working shows $14,112 = 1$ mark

OR

$13.09/13.1 = 1$ mark;

2

- (c) 1. (Growth/increase of) algae/surface plants/algal bloom blocks light;
 2. Reduced/no photosynthesis so (submerged) plants die;
 3. Saprobiotic (microorganisms) aerobically respire

OR

Saprobiotic (microorganisms) use oxygen in respiration;

Accept: Saprobiont/saprophyte/ saprotroph

Neutral: decomposer

4. Less oxygen for fish to respire;

4

- (d) 1. Capture/collect sample, mark and release;
2. Ensure marking is not harmful (to fish)

OR

Ensure marking does not affect survival (of fish);

Accept examples e.g., marking should not be toxic.

3. Allow (time for) fish to (randomly) distribute before collecting a second sample;
4. (Population =) number in first sample × number in second sample divided by number of marked fish in second sample/number recaptured;

4

- (e) 1. Less chance of recapturing fish

OR

Unlikely fish distribute randomly/evenly;

Accept 'harder to capture marked fish' (recaptured fish) but ignore 'harder to capture fish'.

Accept that fish may remain in one area.

Accept fish may congregate.

1

[15]

Q2.

- (a) 1. (Colonisation by) pioneer species;
2. Pioneers/species/organisms change the environment/habitat/conditions/factors;
Accept example of change e.g. forms soil/humus/organic matter/nutrients.
Must convey idea of change being caused by pioneers/species/organisms
3. (Environment becomes) less hostile for other/new species
OR
(Environment becomes) more suitable for other/new species
OR
(Environment becomes) less suitable for previous species;
Accept previous species out-competed.
4. Change/increase in diversity/biodiversity;

Ignore increase in genetic diversity.

5. (To) climax community;

4 max

Q3.

- (a) 1. Use a grid
OR
Divide area into squares/sections;
Accept use of tape measures/map/area with coordinates.
Accept Belt transect.
2. Method of obtaining random coordinates/numbers e.g. calculator/computer/random numbers table/generator;
If transect method used accept quadrats at regular intervals or current mark point 2.
3. Count number/frequency in a quadrat/section;
Accept % cover in quadrat/section.
Ignore amount/abundance.
4. Large sample **and** calculate mean/average number (per quadrat/section);
*Accept large sample **and** calculate mean %.*
*Accept large sample **and** method of calculating mean.*
Accept many/multiple for large sample but ignore several.
If a specific number is given it must be 10 or more.
5. Valid method of calculating total number of sundews, e.g. mean number of plants per quadrat/section/m² multiplied by number of quadrats/sections/m² in marsh;
Do not allow 'scale up' without further qualification.
Do not award if % cover determined.

5

(b)

Mark in pairs 1 and 2, or 3 and 4.

Ignore carbohydrates, lipids or named carbohydrate/ lipid.

1. Digestion/breakdown of proteins;
2. Provides amino acids
OR
(Sundew can) produce a **named** (organic) nitrogen-containing compound e.g. proteins, amino acids, DNA, ATP;
Ignore if nitrate or ammonium ions given as products.
3. Digestion/breakdown of **named** (organic) phosphate-containing compound e.g. DNA, RNA;
4. Provides **named** (organic) phosphate-containing product e.g.

nucleotides

OR

(Sundew can) produce a **named** phosphate-containing compound e.g. ATP, DNA;

Accept phosphate as a named product.

2 max

[7]

Q4.

- (a) 1. Method of randomly determining position (of quadrats) e.g. random numbers table/generator;

Ignore line/belt transect

2. Large number/sample of quadrats;

Accept many/multiple

Ignore point quadrat

If a specified number is given, it must be 20 or more

3. Divide total percentage by number of quadrats/samples/readings;

3

- (b) 1. Beach grass is the pioneer (species);

2. Pioneers/named species change the (abiotic) environment/habitat/conditions/factors;

Must convey idea of change being caused by a species

Accept example of change e.g. more humus

3. (So) less hostile for named species

OR

(So) more suitable for named species;

4. Conifer/hardwood trees represent climax community;

4

- (c) 1. Trees block/reduce (sun)light;

Reject 'blocks' all of the light

1

Q5.

- (a) 1. Compete (with fertile males) to mate / for food / resources

OR

intraspecific competition;

2. Do not reproduce / breed

OR

Reduces population (of mosquitoes);

1. *Must convey idea of competition.*

2. *Accept: 'fewer mosquitoes' / 'fewer offspring'.*

2

- (b) 1. Capture / collect / sample, mark **and** release;
 2. Leave time for mosquitoes / Aedes to disperse before second sampling / collection;
 3. (Population =) number in first sample × number in second sample divided by number of marked in second sample / number recaptured;
 3. *Accept: correct equation.* 3
- (c) (Radiation) affects their 'attractiveness' / courtship / survival / life span;
*Accept: 'die / less likely to survive **due** to radiation'.*
Accept: 'disease can be transmitted by other means' (other than mosquitoes). 1
- (d) To maintain number / competition as they die / have a short life span;
Accept: to replace mosquitoes that have died. 1
- (e) 1. Number (of mosquitoes in treated area) is low / lower at / after 12/13/14/15/16 weeks = **2 marks**;
 2. For one mark accept number (of mosquitoes in treated area) is low/lower without reference to relevant week;
Accept: amount for number.
Accept: comparison of numbers (of mosquitoes) for lower/low. 2

[9]

Q6.

- (a) 1. (Overall, data show an) increase in species richness / increase in species diversity / increase in total number of living organisms;
 2. *Baetis quilleri* and / or *Pentaneurini guttipennis* are pioneers;
 3. (Pioneers cause) named change of environment e.g. provide food for other species;
 4. New species / example from data colonise once there is a change;
 5. *Baetis quilleri* / *Pentaneurini guttipennis* / *Helicopsyche mexicana* decline / outcompeted / eaten as succession continues. 5

- (b) Correct answer 5.5 = 2 marks;

Allow 1 mark for correct calculation of mean population growth rate per day for each species, i.e:

$$Cryptolabis paradoxa = 3.226$$

Leptohyphes packeri = 0.585

2

- (c) 1. Same species present (over long time) / stable community (over long time);
2. Abiotic factors (more or less) constant (over time)
3. Populations stable (around carrying capacity)

2 max

[9]

Q7.

- (a) 1. Only cleared and abandoned and introduction of non-native species make (significant) difference;
2. Because only (means of) these ± 2 SDs from zero / no change;
3. About same number / 4 to 3 increase or decrease (species) richness / biodiversity;
- Accept converse for others*

3

- (b) 1. Non-native species out-competes / kills / eats / is a disease of native plants;
2. Some (populations of) native species become extinct (in the community);

2

- (c) 1. Set up grid system with coordinates;
2. Place large number of quadrats (at coordinates) selected at random;
3. Count number of / estimate percentage cover of native plant in quadrats;
3. Repeat at same time each year (for many years);

3 max

- (d) 1. Correct answer two marks – 0.0599;

$$\frac{\log_e(SR2/SR1)}{\text{Time in decades}}$$

1 mark for writing

Award 1 mark for answer of – 5.985 or 0.290

2

[10]

Q8.

- (a) Interspecific (competition);

1

- (b) 1. Do not provide the livestock/cows/horses/yaks with extra food, **as**

their populations will not grow large enough to cause competition

OR

Keep small numbers of livestock/cow/horse/yak, **so** their populations will not grow large enough to cause competition;

*Requires suggestion **and** explanation for each mark*

2. Do not farm horse/choose animals other than horse to farm, **as** they have the same habitat **and** (very) similar food to the ibex;

*Accept farm fewer horses **as** they have the same habitat **and** (very) similar food to the ibex*

3. Keep horses (but) in enclosed/separate areas, **as** they occupy the same habitats as ibex;

Accept descriptions of enclosed areas, eg fenced areas or accept do not let horses out

4. Farm cows, **as** they have the least similar food **and** (one of the least similar) habitat (to that of the ibex);

5. Farm yaks, **as** despite eating the same food, they live in a very different habitat;

6. (Only) grow crops, **so** no competition;

Accept examples of crops

3 max

[4]